

THE MIAMI CONSERVANCY BULLETIN

JANUARY, 1921

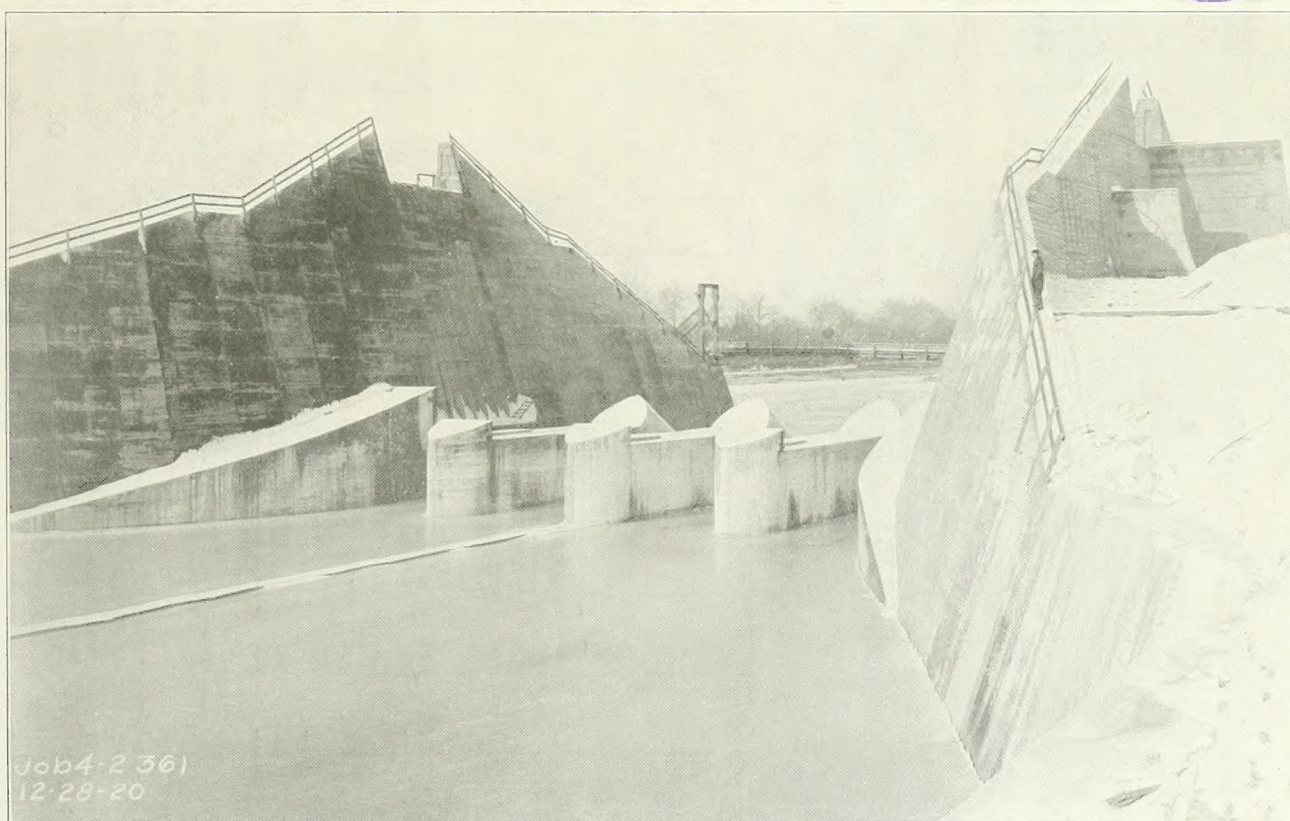
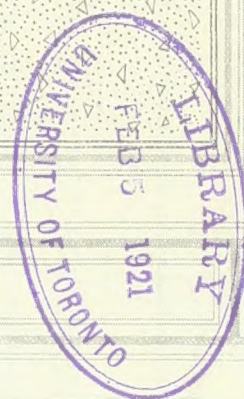


FIG. 246—CONCRETE OUTLET STRUCTURE AT THE TAYLORSVILLE DAM, DEC. 28, 1920.



BOARD OF DIRECTORS
Edward A. Deeds, President
Henry M. Allen
Gordon S. Rentschler
Ezra M. Kuhns, Secretary

Arthur E. Morgan, Chief Engineer
Chas. H. Paul, Asst. Chief Engineer
C. H. Locher, Construction Manager
Oren Britt Brown, Attorney

THE MIAMI CONSERVANCY BULLETIN

PUBLISHED BY THE MIAMI CONSERVANCY DISTRICT
DAYTON, OHIO

Volume 3

January 1921

Number 6

Index

	Page		Page
The Completion of the Taylorsville Outlet Works	85	The Cost of the Taylorsville Concrete	87
Concrete Structure 241 Feet Wide, 111 Feet High and 628 Feet Long, Containing 45,000 Cubic Yards of Concrete, Completed in Its Temporary Form.		November Progress on the Work	88
The Progress of the Taylorsville Concreting	86	The Common Sense of Concrete Mixing	91
Conservancy Daily, Weekly and Monthly Records Broken in Doing This Work.		The Proper Relation Between Theory and Practice in Proportioning Concrete, as Exhibited on the Taylorsville Outlet.	
		Sale of Houses at the Germantown Dam	94-95

Subscription to the Bulletin is 50 cents per year. At news stands 5 cents per copy. Business letters should be sent to Office Engineer, Miami Conservancy District, Dayton, Ohio. Matter for publication should be sent to Bulletin Office, Miami Conservancy District, Dayton, Ohio.

G. L. TEEPLE, Assistant Engineer, EDITOR.

In Memoriam—Adam Schantz

The following resolution was passed at a special meeting of the Board of Directors Jan. 14:

The Board of Directors of the Miami Conservancy District has learned with deep regret of the death of Mr. Adam Schantz, which occurred at St. Augustine, Fla., where he was sojourning in search of health, on Monday, January 10, 1921. As a token of high regard in which the deceased was held by the members of this Board, the officers and employees of the District, it has been deemed appropriate and fitting to pay this humble tribute as a memorial to this and future generations of Mr. Schantz's valuable contributions to the cause of flood prevention.

The deceased was one of the originators of the flood prevention idea in its wider aspects and relationships. He had both witnessed and experienced the devastating flood of March, 1913, and with its memories and experiences deeply impressed in his soul, quickly shared in the conception of a bigger and broader program of protection. Not only did he give generously of his time, thought, service and treasure to the rehabilitation of the devastated areas, but he threw himself with his whole heart into the new plans for securing to the whole valley for all time to come, the fullest measure of protection from a recurrence of floods.

In this work, his generous and unselfish nature shone forth to the utmost degree. Many of the important steps, both before and after the organization of the District, were formulated and taken as a result of his friendly counsel. His judgment in many respects was so accurate that the officers of the District, including the members of this Board, relied upon it with complete confidence.

Mr. Schantz was a molder of public opinion and a leader in public enterprise, both in his native city and the beautiful Miami valley. This Board always found him ready to assist in solving its problems, particularly those relating to the valuation and acquiring of property, and his counsel, service and effort were always cheerfully and freely contributed, as his share in this enterprise of so much moment and importance to every man, woman and child in the valley.

The Board therefore, feels a keen sense of loss in the departure of its friend, and hereby expresses its appreciation of his noble self-sacrifice in the many and varied affairs pertaining to its work, particularly his fine spirit of devotion and unselfish co-operation.

It is accordingly ordered that all work be suspended during the final obsequies of the deceased, that this resolution be entered in the minutes of the Board of Directors, copies furnished to the public press and a copy supplied to the bereaved family.

Ezra M. Kuhns,
Secretary.

Edward A. Deeds,
Henry M. Allen,
Gordon S. Rentschler,
Board of Directors.

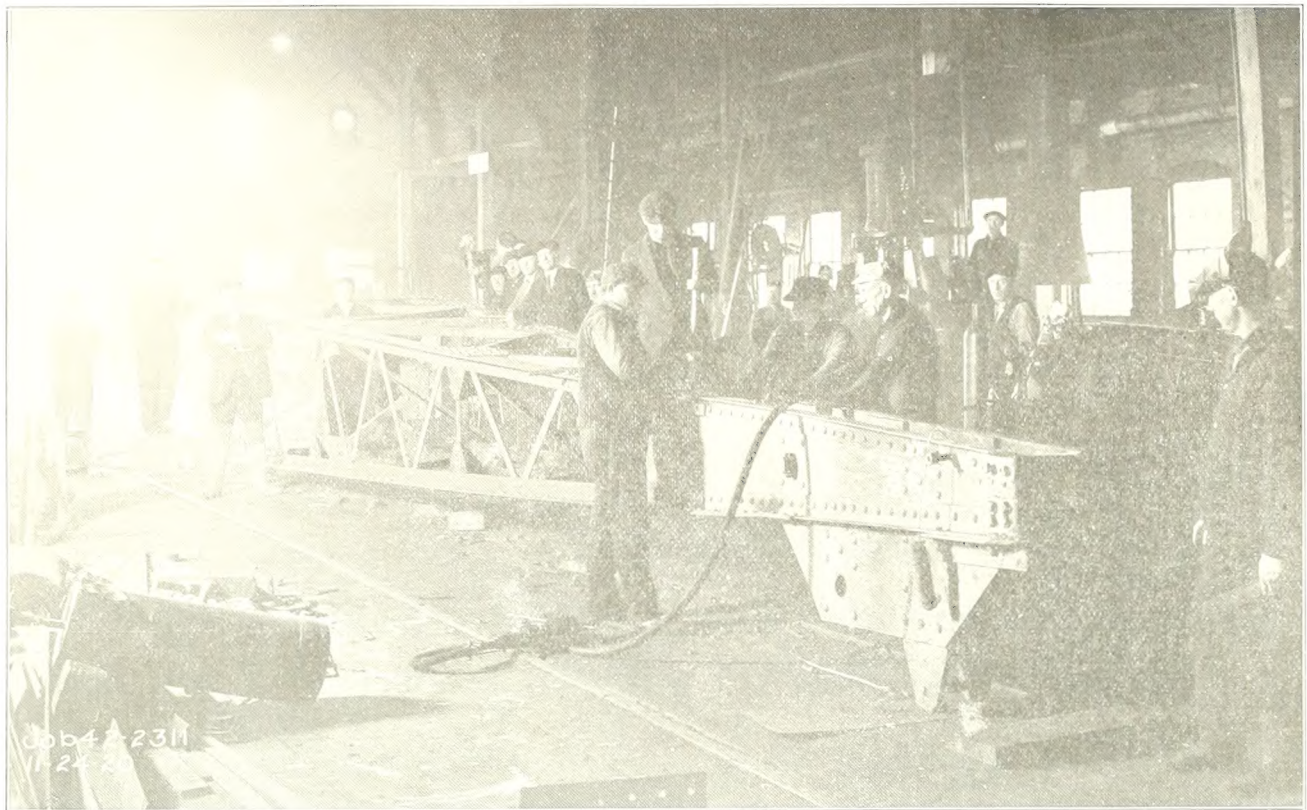


FIG. 248—REPAIRING DRAGLINE EXCAVATOR BOOM IN CONSERVANCY SHOP, NOV. 24, 1920.

A Chart of Conservancy Progress

The Bulletin takes pleasure in presenting again the diagram of construction progress on the project, brought up to date and marking the end of the third season. (See page 82). It gives in the upper left corner the percentage completed on the entire project; below appears a row of similar rectangles showing the state of each individual job. Each black or white band represents one month's work. Vertical scales at each end of the lower row, and beside the upper rectangle, give means of measurement of the percentage completed. The widths of the lower row of rectangles is made proportional to the magnitude of each job, measured by its total cost when complete. The short horizontal marks beside each rectangle show the fraction completed during the season of 1920, the lower mark showing the percentage at the beginning, and the upper one at the end, of the season. The work as a whole is seen to be about 63 per cent done, and is ahead of the calculated time schedule. The chart indicates that unless quite unforeseen conditions intervene, the work will be completed at the date set—the end of 1922, a condition on which the people of the Miami Valley may well look with deep satisfaction.

A Vital Link in the Conservancy Project

It is doubtful if many of us realize what a vital part of the work is embodied in the Conservancy shop. If the diagram shown on page 82 indicates so satisfactory a state of progress—ahead of schedule in spite of unusual difficulties—it is no less true that the picture on this page, Fig. 248, tells one of the best reasons why so good a record can be shown. No one who visits any part of the work of construc-

tion, whether at the dams or on the river, can fail to be struck at the part played by the powerful machinery in doing what in former days would have required the service of thousands of men and horses. At the heart of this system of machinery stands the shop. Machinery on engineering construction, as is well known, is unavoidably and peculiarly subject to grilling usage and heavy strain. The Conservancy machines are in service as a rule twenty hours a day, week in, week out, month in, month out, through the season. Unavoidably pieces wear out or break down. A daily procession of motor trucks brings these wounded members to the Dayton shop, to be mended or replaced. A similar procession takes the fresh pieces back to the job warehouses to replace there the depleted stock, so that the crippled machines will not be held up. Now and then a bigger break occurs, necessitating a stop for a "major operation," such as is shown in the case of the broken dragline boom, exhibited in the picture. Considering these things, let us not forget, in looking back with satisfaction over the past year's work, as we have a right to do, to give due credit to Master Mechanic McIntosh and his assistants, for the large share they have had in the good record.

New Technical Report Out

Part VII of the Technical Reports of the District, which covers the hydraulic design of the flood control, has just been published. Copies of it will be sent postage prepaid to any one on receipt of the price, which has been set at one dollar per copy. It is hoped to present an abstract of the early chapters in the next Bulletin. It is by Prof. S. M. Woodward, Consulting Engineer of the District.

The Completion of the Taylorsville Outlet Works

Concrete Structure 241 Feet Wide, 111 Feet High and 628 Feet Long, Containing 45,000 Cubic Yards of Concrete, Completed In Its Temporary Form.

The massiveness and magnitude of the outlets in their temporary form, make them the most interesting, as they are the largest, of any on the Conservancy project. The entire flood flow of the Miami River, equal at spillway level to 53,600 cubic feet of water per second, must here pass through the four openings indicated in the illustrations. The size of these openings is perhaps best indicated in Fig. 253, which shows one of the three concrete piers which separate the openings, as it appeared when just completed, with half of the form in which the pier nose was cast still suspended in the air as it was being removed. Comparing this with Figs. 246 and 258, where all the piers are shown, will give one an idea of the magnitude of the work. The massive left-hand wall in these last figures, at the base, is 50 feet in thickness, exclusive of the projecting "cut-off wall." The man on the wall in Fig. 246 and the men near the machine at the left in Fig. 258 will also give some indication of the scale of this work. The extreme width of the structure is 241 feet, its length 628 feet, and its height 111 feet. In its present form it contains about 45,000 cubic yards of

concrete, more than half of which, it may be of interest to state, is out of sight below the water level in the pictures just referred to.

As seen in these pictures the structure is not in its final form. When complete a massive concrete cross dam, containing about 10,000 cubic yards of concrete, will extend from wall to wall, resting on the three piers and the side shelves, and roofing the four openings, through which the river will then pass, the rest of the space being blocked, up to a point a little below the notches which appear at the wall summits. These notches are the abutments of a concrete bridge which will span the opening between the walls, carrying the highway (the National Road in its new location), which will cross the valley on the summit of the dam. The floor of this bridge will be on a level with the top of the walls as seen (not the bottoms of the notches), and the space beneath the bridge and between the walls will be the "spillway channel," which will carry the excess water of any extreme flood which might top the concrete cross dam. However, as a flood 40 per cent greater than that of 1913 (giving the maximum

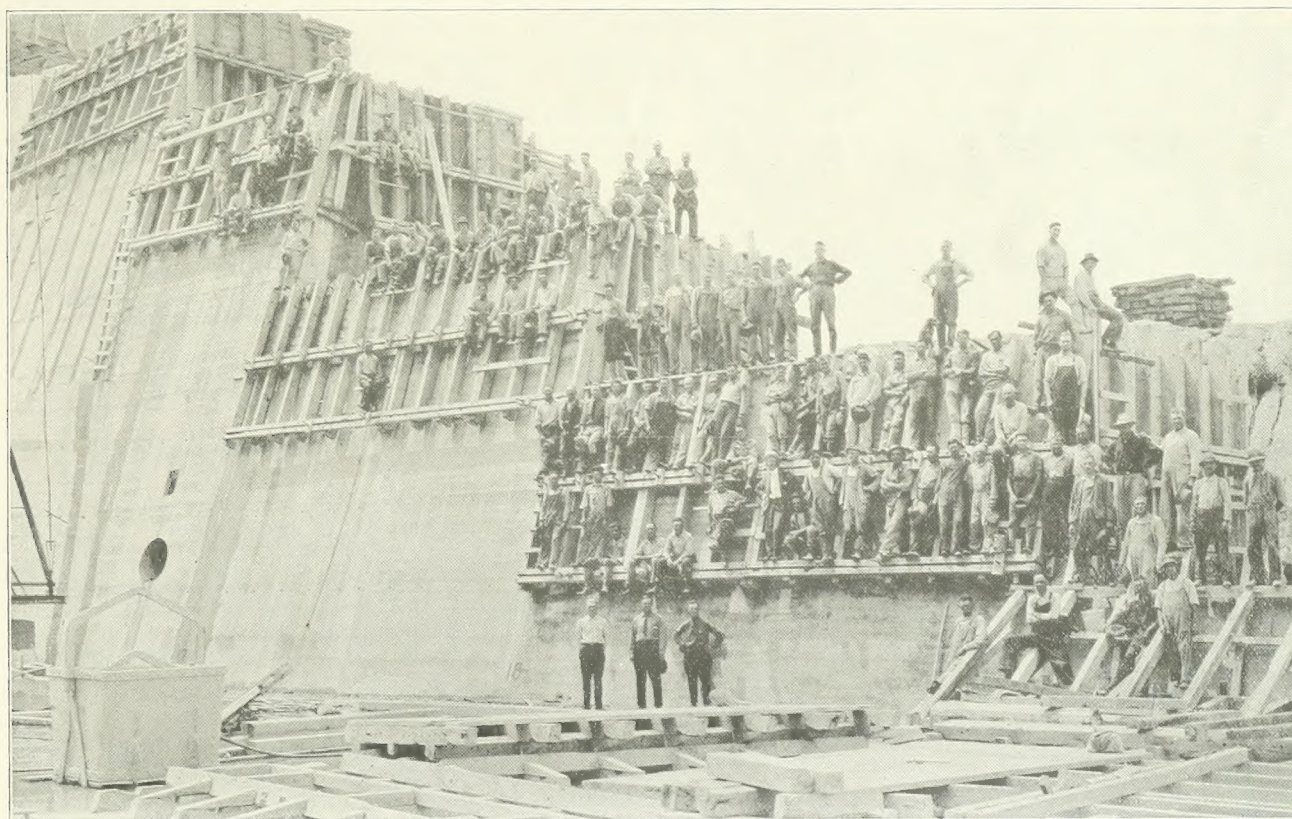


FIG. 249—THE BUILDERS OF THE TAYLORSVILLE OUTLET, AUG. 11, 1920.

The number of workers on the job seems to be large, but actual count totals "95 men and a dog," which for a piece of work of this magnitude, if one stops to consider it, is small. These men built into the outlet structure, on July 29, 568 cubic yards of concrete in the regular working day of ten hours. The same week they placed 2,408 cubic yards, or 401 yards per day; and in 27 consecutive working days they placed 9,280 cubic yards, or 343.7 per day. The quantities may be made more vivid, perhaps, if we remember that a cubic yard is just about an old-fashioned "dump-board" wagon-load. Nothing but the aid of powerful machinery could ever enable so small a force to handle that amount of heavy material. The water of the Miami River now occupies the place where the men in the foreground stand. The space beyond the wall will be occupied by the earth embankment of the dam, which will follow the general slope as seen, (the big "steps" being temporary features). The massive thickness of the wall, (50 feet at the base,) is to withstand the side pressure of this earth, tending to overturn it.

Horizontal distances represent time, the vertical lines being ten days apart, and the years, months and days marked below. Vertical distances represent concrete placed, the space between two consecutive horizontal lines representing 3,000 cubic yards. The heavy line represents the actual progress of the concreting. Thus on June 2, 1920, the heavy line is about $7\frac{1}{3}$ divisions above the base, indicating about 22,000 cubic yards of concrete in place on that date. The broken shows the progress as planned.

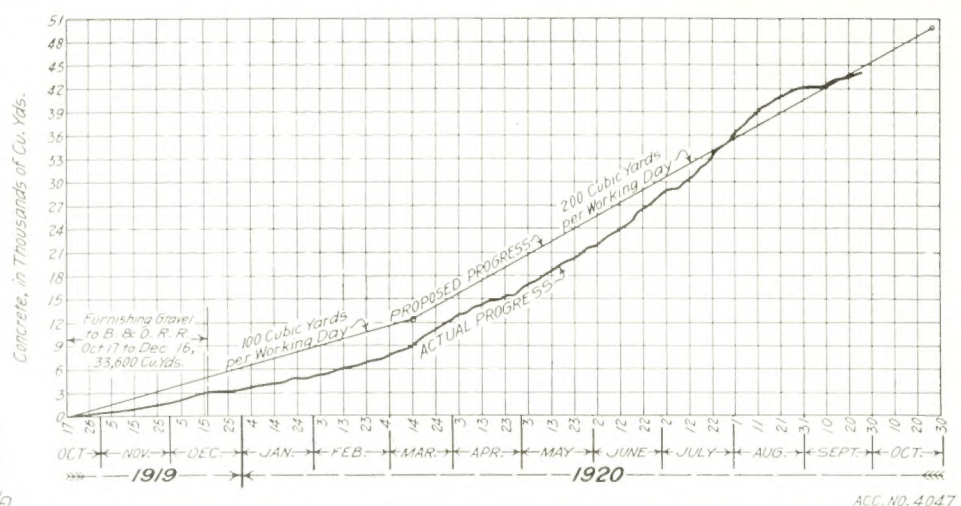


FIG. 250—PROGRESS CHART OF THE CONCRETING, TAYLORSVILLE OUTLET.

which it is thought can ever be reached in the Miami valley), will still fall more than 17 feet short of reaching the crest of the dam*, the likelihood that water will ever go over the spillway, to say nothing of overtopping the dam, is seen to be extremely remote. To top the dam itself will take a flood more than double that of 1913.

The flood discharge of the Miami at Taylorsville in 1913 was 127,300 cubic feet per second, which the new outlet works would reduce to 51,300. These figures should be compared with the two next highest 1913 discharges in the valley, 78,300 at Huffman, on Mad River, reduced to 32,600, and 85,400 on the Stillwater at Englewood, reduced to 11,000. The reduction in flood flow at Taylorsville could have been easily made considerably more by constricting the conduits, but for the cities of Troy and

Tippecanoe on the edge of the retarding basin, where a raising of the dam height would have required an objectionable raising of the levees.

As it is, the discharge of a spillway level flood through the Taylorsville outlets, if one should ever occur, which is unlikely, will be an imposing spectacle, 53,600 cubic feet of water, equal to 1,675 tons, or about the mass of a twenty-five car freight train, rushing through the conduits every second at a speed of 33 miles per hour and dashing itself into a "standing wave" of lathering foam, twenty feet or more in height, in the massive concrete basin prepared to receive it at the outlet end. It is this massive basin, 200 feet in width, which appears in the foreground in Fig. 258. By it the speed of the water will be checked to a harmless rate of six or seven feet per second, as it issues into the valley below.

The Progress of the Taylorsville Concreting

Conservancy Daily, Weekly and Monthly Records Broken in Doing This Work.

One of the most satisfactory things about the Taylorsville outlet construction was the excellent rate of progress on the work. This is shown in the progress chart in Fig. 250. Horizontal distances on this chart represent time, the years, months and days being marked. Each vertical division represents 3,000 cubic yards of concrete placed in the walls and floors. The heavy line shows the actual progress of the placing. Thus on June 2, 1920, the heavy line is about seven and a third divisions above the base, indicating about 22,000 cubic yards of concrete deposited in place up to that date. The broken straight line just above the heavy line shows the schedule of proposed progress set by the engineers at the beginning of the work, the rate being 100 cubic yards per day from the beginning (on October 17, 1919), up to March 15, 1920, and 200 cubic yards per day after that date.

Several interesting things are brought out on this chart. One is that at the beginning the curve of actual progress dropped distinctly below the 100 yard per day set. The reason for this was the lack of sufficient gravel to keep up the pace, and this in

turn was due to the necessities of the Baltimore and Ohio Railway relocation. The Taylorsville borrow pit was in fact furnishing gravel ballast for the new tracks, and this continued from the beginning up to December 16, the total furnished for this purpose during this period being 33,000 cubic yards, a fact noted on the chart. The equipment was not of sufficient capacity to keep both the railway and the outlet work going at full speed. The railway work was in fact delayed beyond the date originally estimated; hence the interference.

It will be noted that the rate of actual progress did not at once pick up much, following the completion of the ballasting, and this was due to the winter weather. The season was rather severe, and this held the work back, a matter commented on later. From March 15 on, however, the rate accelerates at once as an average, to the standard 200 cubic yards per day set, and so continues till the middle of June, when it again speeds up and about July 25 reached and crossed the line of the proposed progress. It dropped again as the work approached its end, unavoidably, as most concrete work slows up in the "puttering" details of finishing the job. The last concrete was poured on September 25.

*The top of the concrete cross dam, or "spillway weir," will be 19 feet below the dam crest.

The rate of placing during July and August exceeded considerably, in fact, the expectation, and broke all previous records on Conservancy work. This might perhaps be expected, the work being considerably more massive than any other Conservancy job, and therefore permitting the development of more efficient "quantity production." Nevertheless, much credit must be given to those in charge, the chart showing that the work was finished about one month ahead of the expected date.

The record day's work at Taylorsville was 568 cubic yards of concrete in place, made on Monday, July 29, the high record at any other dam being 374 cubic yards. This was in one ten-hour shift. The high week included the record day and ended July 24, with 2,408 yards placed, or at the rate of 401 yards per 10-hour shift. In 27 consecutive working days 9,280 cubic yards were placed, or at the rate of 343.7 yards per day. The day's work was always in one 10-hour shift.

The men in charge of the work at Taylorsville have been O. N. Floyd, Division Engineer; H. L. Freund, Assistant Engineer; Ben. H. Petty, and C. O. Shively, successive Office Engineers, and H. M. Sherwood, Superintendent of Construction. Those in direct charge of the concreting were H. R. Daubenspeck, Assistant Engineer, inspector of mixing; W. J. Smith, Jr., Assistant Engineer, inspector of placing; W. D. Rogers, General Foreman at the forms; and C. P. Heckman, Foreman at the screening and mixing plant.

The Cost of the Concreting

The favorable rate of progress, indicated by the chart, is of course connected with the question of cost. The original estimate of this was \$9.47 per cubic yard of concrete, as an average for the several classes of the material placed, the classes depending upon the amount of cement required, the difficulty of placing (as requiring pumping when below water level, for instance), and other factors. The \$9.47 was divided into \$2.87 for the cement ($1\frac{1}{4}$ barrels at \$2.30 per barrel), and \$6.60 per cubic yard for the remaining items (shown in the table below). The actual cost has been \$10.00 per cubic yard. The estimate was made in 1917. In consideration

of the general conditions confronting construction work during the period when the work was being done, the showing is a very creditable one for the engineers and workers on the job. It represents in dollars and cents the careful attention to details pointed out in another paragraph.

The division of the cost per cubic yard, just referred to, is given in the following table. It is based on "pay yardage," computed to the "neat line" of the masonry, this quantity being 42,243 cubic yards.

Distribution of Concreting Costs

Item	Cost Per Cubic Yard	Per Cent of Total
Labor	\$ 3.51	35.1
Supplies (cement, lumber, repair parts, etc.).....	3.02	30.2
Power (coal, electricity, gasoline)	0.37	3.7
Plant (erection, depreciation, camp)	2.43	24.3
Industrial Insurance (2.45 cent of payroll).....	0.67	6.7
Job Overhead (20 per cent of payroll)		
Total	\$10.00	100.0

The items under labor may be of interest. The figures give the cost per cubic yard of the several divisions.

Distribution of Labor Costs

Laying Tracks (in borrowpit).....	\$1.29
Excavating Gravel	3.33
Screening and Washing Gravel.....	1.95
Mixing and Placing.....	5.40
Building Forms	9.44
Trestle and Concrete Tracks	3.10
Repairs	0.67
Placing Reinforcement	0.11
Unloading Cement	0.47
Cleaning Up	0.32
General and Miscell. (including heating).....	4.37
Storing Aggregate (extra labor only).....	0.67
Dismantling and General Cleaning Up.....	0.50
Total	\$3.51

Compare Fig. 253, showing the form being removed from the nose of a just finished pier, (the nearest pier in the picture here shown). The plan of these piers is shown in Fig. 254 in its relation to the structure. The three piers, with the two abutment shelves in the walls on each side, will support the concrete cross dam to be later built blocking the space between the walls. (See front and back cover pictures.) The men at work on the second pier give the scale. The derrick handled the forms and concrete buckets.

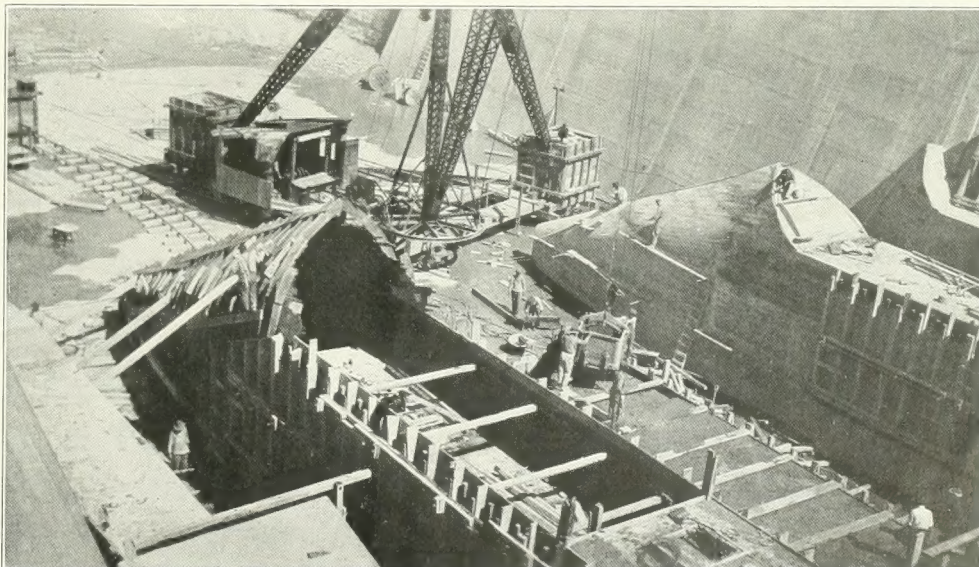


FIG. 251—OUTLET PIERS UNDER CONSTRUCTION, TAYLORSVILLE DAM, SEPT. 16, 1920.

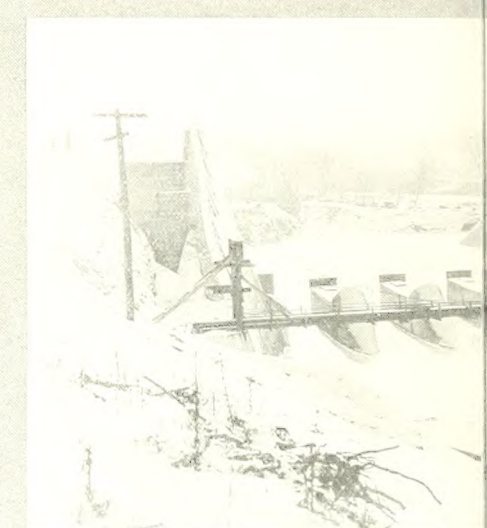
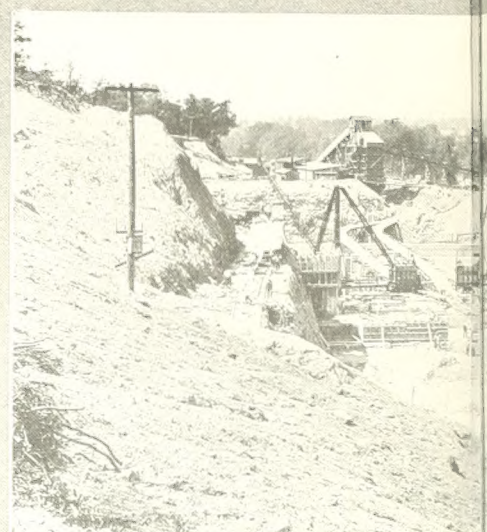
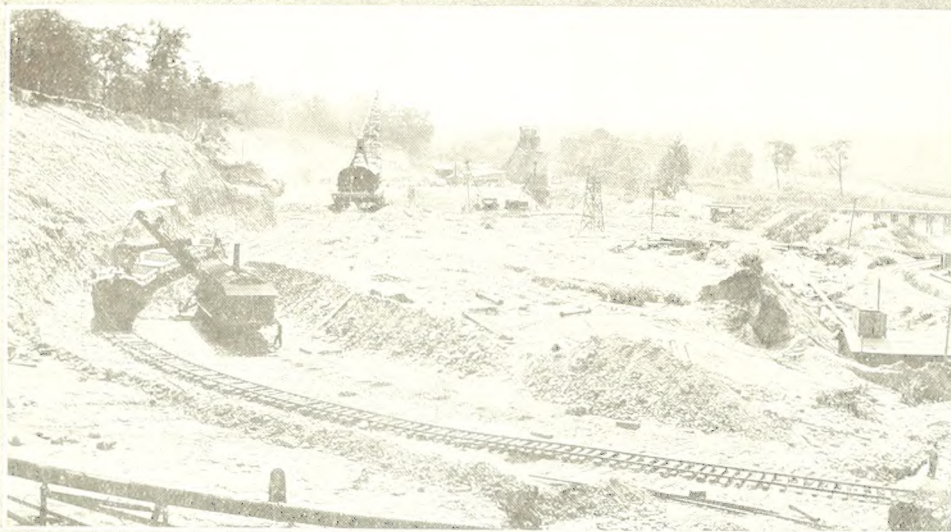


FIG. 252—PROGRESS ON THE CONSTRUCTION

The view in each case is toward the southwest, with the gravel washing and screening plant in the distance, (except in lower right picture.) The upper left shows the rock excavation at an early stage, (Aug. 28, 1920.) concreting not being as yet begun. The upper middle, taken June 11, 1920, shows the rock excavation complete, the pool basins complete and the walls well along. The upper right, taken Aug. 11, 1920, shows the east (left) wall up to full height, the west one nearly so, and the upstream half of both walls well along. The lower left, taken Sept. 16, 1920, shows both walls complete and the piers under construction. The lower right and middle, (panorama) shows the structure complete in its temporary condition, as it was on Dec. 28, 1920. The boom of the dragline excavator seen in this picture will furnish a good scale, it being just 100 feet in length. The entire structure is 241 feet in total width, (not including the "cut-off" walls seen projecting at right angles to the main walls,) and 628 feet in extreme length, with a total height of 111 feet from

November Progress on the Work

GERMANTOWN

The principal work this month was putting in the permanent floor in the conduits. The work on the north conduit was completed November 24, 1920, and the creek turned through November 29, 1920. The south conduit was completed December 21, 1920, and the creek turned through December 27, 1920. This marks the completion of the dam from the flood retarding standpoint. However, there is considerable cleaning up, trimming and dismantling to do.

Work was started on the guard rail across the top of the dam this month.

Another work of importance is the placing of slope re-vestment along the south bank of the outlet channel and immediately adjacent to the outlet works.

The new sloping concrete nose on the inlet partition wall was placed this month.

The dismantling of the monitor pump house, the primary dredge pump house and the hog box, and the removing of the local warehouse stock, have been completed. The dismantling of the large Lidgerwood dragline was started also. The small Marion dragline has been moved into Germantown, where it will act as a derrick for loading equipment on cars at the railroad yards.

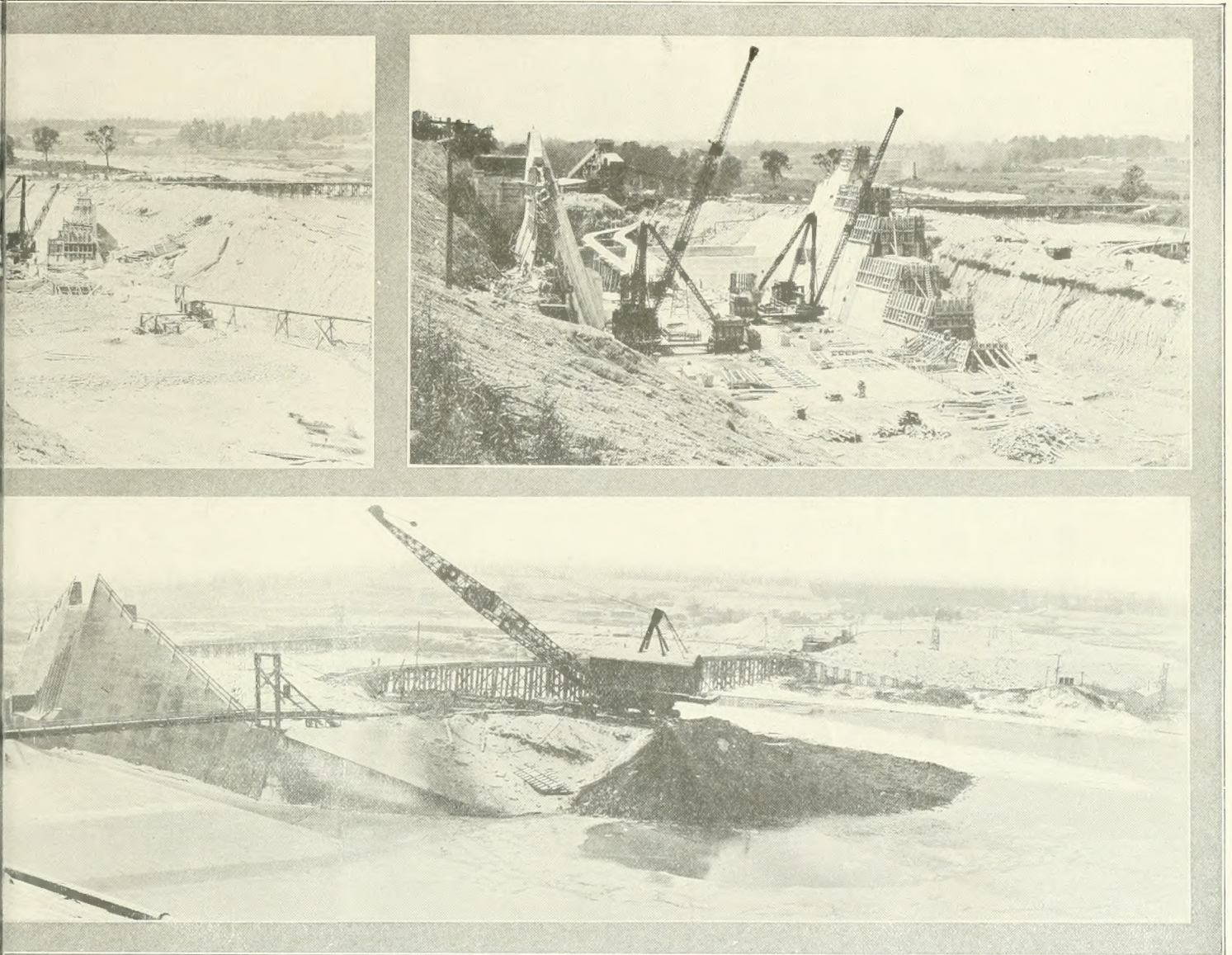
A. L. Pauls, Division Engineer.

December 30, 1920.

ENGLEWOOD

The major operations in connection with the construction of this dam during the past month have consisted of pumping hydraulic fill and of excavating for the permanent spillway.

During the estimate month ending November 25, 143,000 cubic yards were pumped into the hydraulic fill, using



OF THE TAYLORSVILLE OUTLET WORKS.

top of walls to base of foundation. It contains in its present condition about 45,000 cubic yards of concrete, (more than half of which is not seen in the picture, being out of sight below the water surface,) and with the concrete cross dam and spillway apron to be built will contain, in final form, 55,000 cubic yards. The west wall, at the right, is 50 feet thick at the base, to withstand the great pressure, (equal to many thousands of tons.) of the earth embankment of the dam during construction. This embankment will rest against the further face of this wall, and be flush with the wall slopes, extending thence across the river to the far side of the valley. The Miami River is seen just beyond the dragline machine, flowing in its old channel still. Its waters now occupy, however, the new channel as far as the far end of the concrete structure, beyond which they are still blocked, the downstream (far) end of the channel not having as yet been excavated. This excavation will be completed this winter and the river turned through.

Sumps Nos. 2 and 3 in rotation. The total embankment on this date was 2,186,000 cubic yards, or 61 per cent of the completed dam.

The large electric dragline excavated 11,000 cubic yards for the permanent spillway, placing the material into a temporary spoil pile from which it will be rehandled into a levee paralleling the spillway outlet channel.

Carpenters worked intermittently on the cribwork protection for the spur levee at the outlet of the temporary spillway.

H. S. R. McCurdy, Division Engineer.

December 15, 1920.

LOCKINGTON

Practically all work at Lockington Dam was stopped December 23rd for the winter. Nothing would be gained by working to disadvantage under freezing conditions, as all features are safe against flood and the date of the completion of the dam is controlled by the duration of the

concrete work, which could not be commenced before spring. The mess hall and the store have been closed until work is resumed.

The levees around the core pool on the dam are at most places up to the top berm, 20 feet from the top. Stone slope dressing has been keeping pace with the fill and the drain ditches have been commenced.

Drilling of well holes from 20 to 40 feet deep will be done under contract this winter for blasting the blue clay which constitutes the major portion of the borrow pit to be worked next year. The intention is to blast the ground so that it may soften by "weathering" before it is sluiced.

The camp is now being supplied with 2300 volt power from Piqua over the 33,000 volt line. The change was made in order to disconnect the high voltage transformers at Lockington and thus save the core losses which would cost, for power, about \$800 during the winter.

Barton M. Jones, Division Engineer.

December 24, 1920.

TAYLORSVILLE

The Lidgerwood dragline has finished the excavation on the inlet channel and is about ready to start tracking down to begin the excavation in the outlet channel. Two well drills have been making good progress drilling the rock in the outlet channel so that this can be shot by the time the dragline arrives to start digging.

The gravel plant is about all torn down, and this and other buildings, together with rubbish, are being removed from the area to be excavated.

The sluicing was shut down on the 23rd for the winter, and the dredge pumps are being repaired and the pipe lines relaid and renewed where needed.

The stone paving at the west edge of the outlet channel has been completed up to elevation 782, (18 feet above mean low water,) and the Bucyrus dragline is being overhauled and dismantled to send to the Franklin job.

Nothing has been done on Road 12 this month except laying some pipe culverts.

O. N. Floyd, Division Engineer.

December 30, 1920.

HUFFMAN

During the month of November, 59,000 cubic yards of material were pumped into the dam. The total embankment December 1st was 507,000 cubic yards.

The gaps left for the Erie Railroad at the north end of the dam and for the diversion channel near the south end, have been entirely closed, and the dam from the outlet works to the hill at the north end, a total length of 2700 feet, is being carried up as a unit.

The steam dragline is now building the levee slope on the downstream side of the dam. After completing the lift it is now on, it will be used to finish up some excavation in the river channel below the outlet works.

A three-quarter yard dragline bucket has been put on the American Ditcher, used on the railroad work, and this machine is now building levee slope on the upstream side of the dam.

The placing of heavy rip-rap on the north bank of the entrance channel to the outlet works has been completed. The south bank is in a rock cut and will not require any rip-rap.

Oversize rock rejected by the screen at the pumping plant is being hauled away and placed as surface paving on the upstream slope of the dam.

C. C. Chambers, Division Engineer.

December 24, 1920.

DAYTON

Dragline D-16-15 is completing its work in connection with the laying of a 16" water main upstream from Stewart street bridge. D-16-16 has crossed the river below Third street and will now complete the channel excavation on the right side of the channel between Third and Fifth streets. D-16-8 is undergoing repairs at the gravel plant. D-16-19 is nearly through with its work on the levee at McKinley Park and will soon cross the river to perform the remaining channel excavation near Dayton View bridge, throwing the material back into a spoil bank opposite.

Stillwater Drive wall is complete except for the coping section, 3730 cubic yards of concrete, or 98% of the total quantity, being in place. The concreting plant has been dismantled. The backfilling is about half completed. Beach avenue wall is 45% complete, 1500 cubic yards of concrete being in place. First street wall is 38% complete, 670 cubic yards being in place. Construction of the several small retaining walls along the Mad River levees has been started.

Price Brothers are driving a steel piling barrier to stream bed grade across the mouth of Wolf Creek.

J. C. McCann has started the earthwork construction on Mad River, excavating from the north bank above Keowee street. Four houses on Ohio street are being removed in connection with that work.

To date 56,800 cubic yards of sand and gravel have been issued from the gravel plant.

Previous to December 1, 853,100 cubic yards of channel excavation (Item 9) had been removed and 147,800 cubic yards of levee embankment placed. The total yardage handled in accomplishing that work amounted to 1,869,400 cubic yards. These figures do not include 105,000 cubic yards of excess excavation for the launching basin and scowling canals.

C. A. Bock, Division Engineer.

December 17, 1920.

HAMILTON

The total amount of channel excavation (Item 9) to December 1st, was 827,700 cubic yards. The electric dragline, D-16-18, is working between the railroad and the Columbia bridge, finishing up the west bank.

At the Black street bridge all of pier 5 and the footing of pier 6 have been completed. The dragline has driven the piling for the falsework on span No. 6 and part of span No. 5.

Price Brothers have driven a trestle for the support of the Belt Line Railroad at the west end of the bridge and the track is now being moved to this temporary location. As soon as this track is moved the dragline will start excavating for the west abutment.

Price Brothers have started to drive piling for the revetment on the west side of the river south of the Main street bridge.

The driving of steel sheet piling and the excavation are being continued on the Black-Clawson wall.

C. H. Eiffert, Division Engineer.

December 22, 1920.

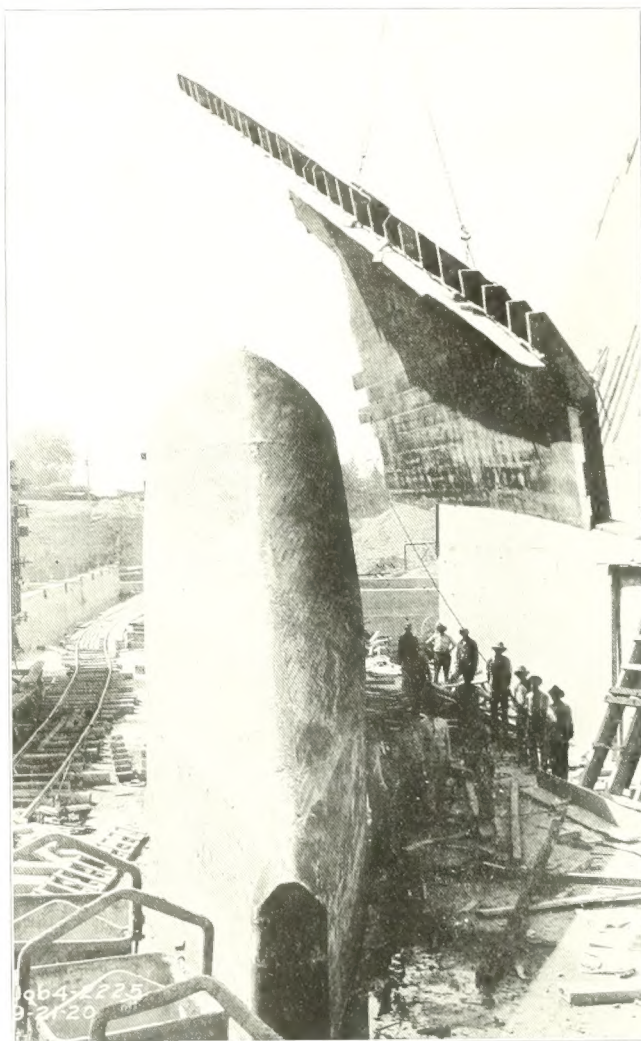


FIG. 253—LIFTING FORM FROM UPSTREAM NOSE OF AN OUTLET PIER. SEPT. 21, 1920.

This is the near pier of Fig. 251. The nose is made of the shape seen as a protection against drift ice, and other floating debris. The form in the air is one-half of that seen in Fig. 251. The $1\frac{1}{4}$ cubic yard buckets used to carry the concrete appear in the lower left corner. They are carried on small platform cars running on the track at the left, and lifted by the derrick. The piers are 11 feet wide and about 100 feet in extreme length, the four conduit openings formed by the piers and side walls being 15 feet wide and 40 feet long, with a total height of 19 feet 2 inches.

UPPER RIVER WORK

Troy—The dragline, under the direction of Donald Jeffrey, completed its river excavation between the Market street and B. & O. bridges on December 10th and moved back to the B. & O. embankment, in order to place about 1,000 cubic yards of earth to form a siding for the new city electric light plant. Since then it has crossed over North Market street and is at present excavating in the river channel on the upper side of the Market street bridge. The excavation under the Market street bridge will be completed, and the dragline will then start excavating the narrow channel and building the levee on the right side of the river, between the Market and Adams street bridges.

The C. & C. Haulage Company has continued to haul gravel from the river channel below Market street into the spoil banks on either side of North Market street. The high water of Thanksgiving week caused a delay of one week, and only one of their two shovels has been working since then.

The Finke Engineering Company has been idle since our last report, due to the flooding of their borrow pit and the weather conditions making the hauling so heavy. They are starting operations again at this time.

Piqua—During the last month, the electrical department has placed a transformer station near the place where the dragline is to be unloaded, and the derrick has been assembled on the ground in readiness to be raised into position.

Tippecanoe City—The District electrical department has started to place a pole line along the location of the proposed levee, which parallels the M. & E. Canal for some distance. The power will be obtained from the Dayton Power and Light Co. and the construction line will connect with their line near the D. & T. power plant at the southeast end of town.

A. F. Griffin, Assistant Engineer.

December 20, 1920.

LOWER RIVER WORK

Miamisburg—During the past month Cole Brothers have constructed 1,000 lineal feet of the east levee, bringing it to a point just back of the Miamisburg paper mill. Here it will be necessary to construct concrete conduits and flood gates to take care of the tail race of the mill. In order to reduce the yardage of concrete and facilitate construction a new permanent channel more nearly at right angles to the levee line was excavated with the dragline, and a temporary channel was also dug. The water is now flowing through the temporary channel, thus leaving the permanent channel free from running water during construction of the concrete work. A storage pile of material has been left with which to fill the gap across the two channels. The dragline has crossed the old tail race and is again building levee.

Franklin—Jeffrey, Boorhem & Co. have completed the levee on the west side and are shipping out their equipment.

The Cincinnati Northern Railway has commenced the work of raising their bridge and track, as required by the District, in order to give the necessary cross-sectional area in the river channel.

Middletown—Price Brothers have completed the revetment construction and commenced work on the Hydraulic street crest wall. About 100 lineal feet of wall has been constructed, leaving 1,275 lineal feet to be built.

F. G. Blackwell, Assistant Engineer.

December 22, 1920.

RAILWAY RELOCATION

Big Four & Erie—There is very little to add to the report of December. M. K. Frank has dismantled the old Erie track from Dayton to the Mud Run bridge just east of Osborn. This work is 75% completed.

Baltimore & Ohio—Mr. J. C. McCann has completed the contract for the work at the Narrows. This finishes the relocation of this railroad.

Ohio Electric Railway—The date for beginning operation of the Ohio Electric from Huffman to Fairfield has been tentatively set for January 10, 1921. The railway company are now bonding the rails.

Albert Larsen, Division Engineer.

December 30, 1920.

RIVER AND WEATHER CONDITIONS

The rainfall in the Miami Valley during the month of November varied from 3.42 inches at Germantown to 4.45 inches at Taylorsville. The most of the precipitation occurred in two storms; the first on the 16th and 17th, in which the precipitation was in the form of snow, and the second, on the 21st and 22nd. The rainfall during the latter, together with the melted snow from the former, resulted in small rises of from 5 to 10 feet in the streams throughout the valley.

At the Dayton Weather Bureau office the total precipitation was 3.46 inches, or 0.57 inches greater than normal; the mean temperature was 41.4 degrees, or 0.9 degrees less than normal; there were 6 clear days, 7 partly cloudy days, 17 cloudy days, and 14 days on which the precipitation amounted to 0.01 of an inch or more; the average wind velocity was 10.1 miles per hour, the prevailing direction being from the southwest; and the maximum velocity for five minutes was 28 miles per hour from the northwest, on the 2nd.

Ivan E. Houk, District Forecaster.

December 30, 1920.

The Common Sense of Concrete Mixing

The Proper Relation Between Theory and Practice in Proportioning Concrete, as Exhibited on the Taylorsville Outlet.

Much has been said and written about theoretical mixes of sand and gravel for concrete, so proportioned that the voids in the coarser sizes are just filled by the next size smaller, and the voids in these by the next; and so on down to the cement itself, which is then supposed to fill the final voids and lock the whole mix into one solid mass. But the conditions at Taylorsville are a capital illustration of the frequent collision between the demands of actual work and the teachings of these fine spun theories. It comes down to a question of dollars and cents. In actual work one must take beds of gravel as they occur conveniently to the work, with such rejection of undesirable sizes as screening costs permit, the expense of inhaul usually more than off-setting any gain in cement obtained by going to a distance. At Taylorsville the grading of the sand and gravel in the beds (in the valley bottom next the dam,) was very irregular. A screening plant separating the sizes, to be subsequently recombined, (see Bulletin for April, 1919,) could not entirely cure this diffi-

culty, on account of the preponderance of finer gravel. All washed material below $\frac{1}{4}$ inch went into the sand bin. The gravel was screened into two sizes—fine, running from $\frac{1}{4}$ inch to $1\frac{1}{2}$ inch, and coarse, running from $1\frac{1}{2}$ inch to 3 inch, (with a little "oversize" rock thrown in as it came in the pit). The rule was to combine these two grades in the mixing "50-50," because experiments showed this gave least voids in the mix and hence, theoretically, solidest concrete... But in practice, most of the time the finer gravel exceeded the coarser in the ratio of 18 to 15, or even 17 to 13, and as the throwing away of the excess finer size, after washing and screening it, would be a foolish waste without corresponding gain in strength of concrete, the variation was permitted and the entire gravel material used up. (With exceptions noted later.) The strength of the mix was assured by breaking concrete cylinders, made from the actual materials put in the work, in a testing machine, leaving always the standard margin for safety.

Much more flagrantly theory was disregarded in the proportioning of the sand to the gravel, in order to secure economy in working the concrete in the forms. Fresh "pudding" concrete, dumped from the bucket in masses equal to a wagon load, has to be tramped and shoveled laboriously into place in the forms by men in heavy hip rubber boots, wading about a foot deep in the fluid material. The mixture consists of a mortar of sand, cement and water, to which enough gravel has been added to make a thick pudding. In the tramping and shoveling the mortar acts as "grease" to the gravel, greatly facilitating the getting of the dumped mass to all sides and corners of the form. The mortar acting as binder to the gravel, the strength of the resulting concrete depends on the strength of the mortar, and gravel may theoretically be added as long as there is mortar enough to fill the voids without loss of strength. Practically, long before the point of saturation, when the voids had been reached, the concrete began to crumble under the heavy mortar "grease" used for the tramping and shoveling.

laborious at best, became so much so as inordinately to increase the cost. Hence the practical rule,—secure a mortar of sufficient strength, and then add as much gravel to it as it will bear and still work smoothly in the forms; and the tests at Taylorsville (described in the Bulletin for March, 1920), were simply to determine what proportions of the sand and gravel, with the peculiarities of grading in size of these materials in the Taylorsville pits, would have to be measured into the concrete mixer in order to secure a mix which when it arrived at the forms would fulfill this practical test.

But this practical rule came into sharp conflict with theoretical concreting mixing. The "50-50" combination of fine and coarse gravel (16 cubic feet of each to the batch of concrete,) was found experimentally to contain 34.8 per cent of voids, and to shrink in the process of mixing to a volume of 25.8 cubic feet. Its voids then were 9 cubic feet. Theoretically, this would mean that 9 cubic feet of sand must be added to fill these voids, with sufficient cement to fill the sand voids, and enough water to

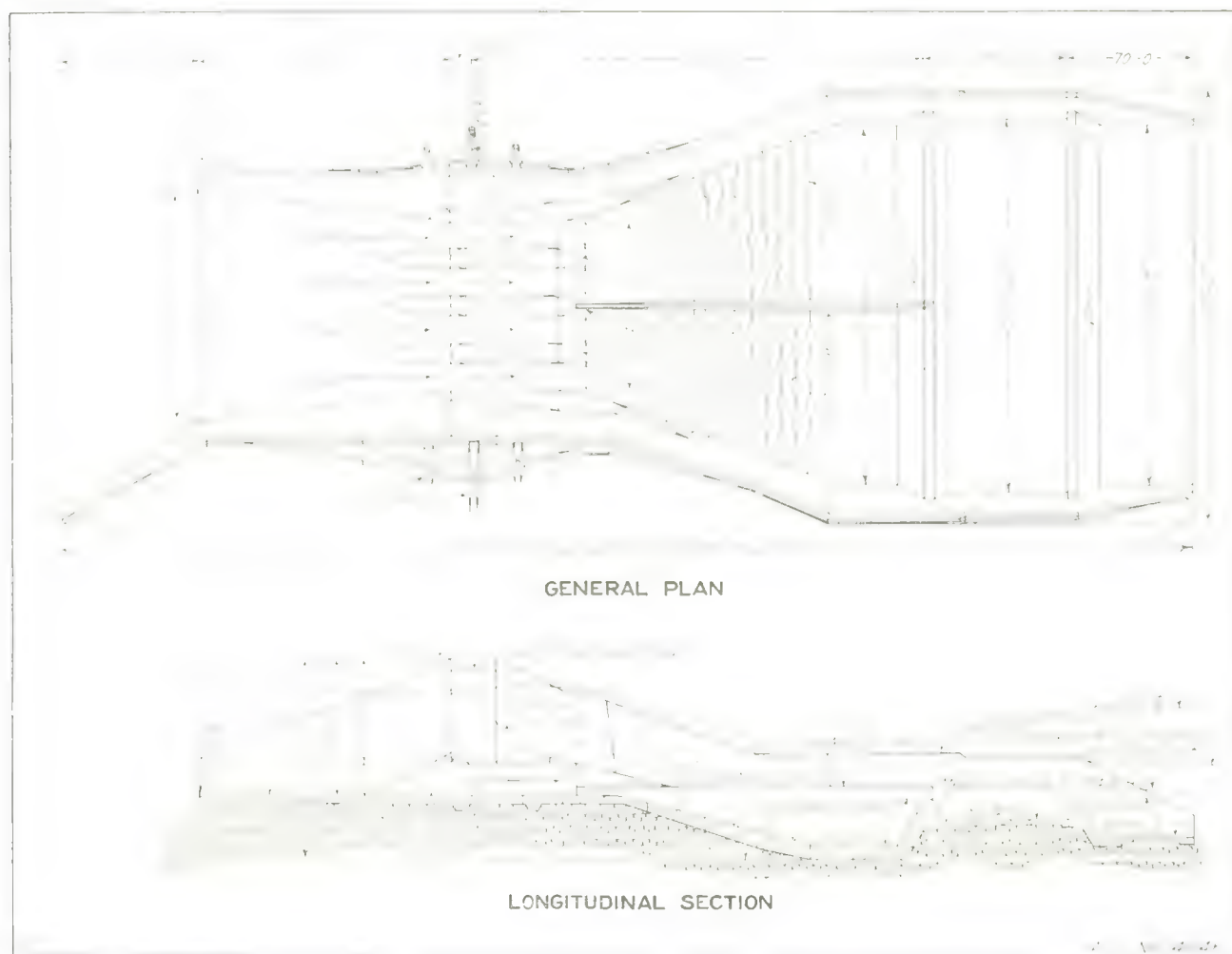


FIG. 254—PLAN AND LONGITUDINAL SECTION OF TAYLORSVILLE OUTLET WORKS.

The dimensions are given and need not be repeated. Note the dotted outline of the spillway structure, comprising about 10,000 cubic yards of concrete, which is yet to be built, (after the earth embankment is completed,) as a cross dam between the walls, whose crest is the spillway floor, and beneath which are the conduit openings. The flow of the river will be toward the right. Note how the cross section of the four conduits, (15 by 19' 2" each, totaling 60' by 19' 2") broadens and deepens down the notched stairway into the basins below, the hydraulic jump pool, (just above the left hand weir,) being 200 feet wide and 33 feet deep below the top of the central partition wall, (the latter being seen in Fig. 258 with its top just above the water level.) It is this broadening and deepening, which, together with the weir, produces the hydraulic jump that absorbs the destructive energy of the issuing water.

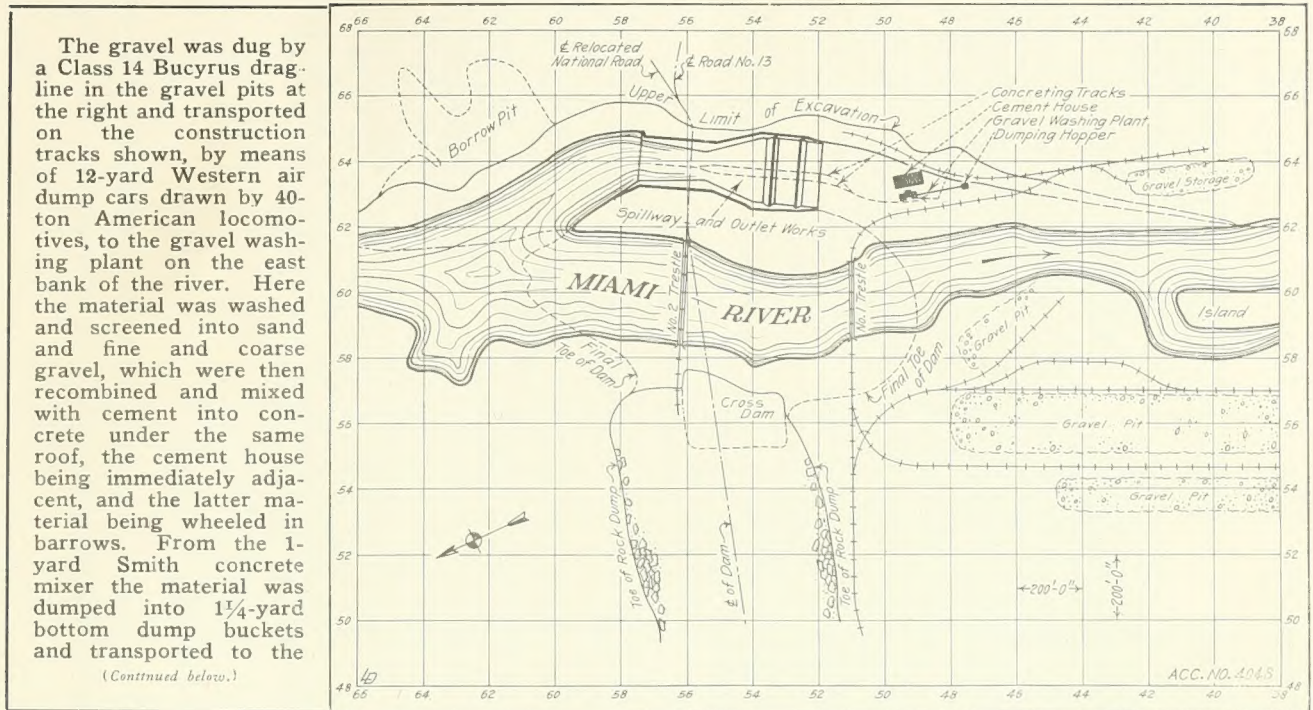


FIG. 255—PLAN OF TAYLORSVILLE CONCRETING LAYOUT.

forms on small platform cars, drawn by three-foot gage Fate gasoline locomotives. The buckets were lifted and dumped by two stiff-leg electric derricks with 105-foot steel booms, (later 90-foot) two being necessary on account of the great width of the work, (241 feet maximum.)

make a proper mortar. Practically, however, 9 cubic feet of sand gave a concrete which was so difficult to tramp and shovel into place in the forms that using this proportion was out of the question. The proportion of sand had to be run up to 13 cubic feet—an increase of more than 50 per cent over the theoretical quantity—to secure a smoothly working, economical concrete, (the strength again being always and regularly checked by breaking tests of the actual material used).

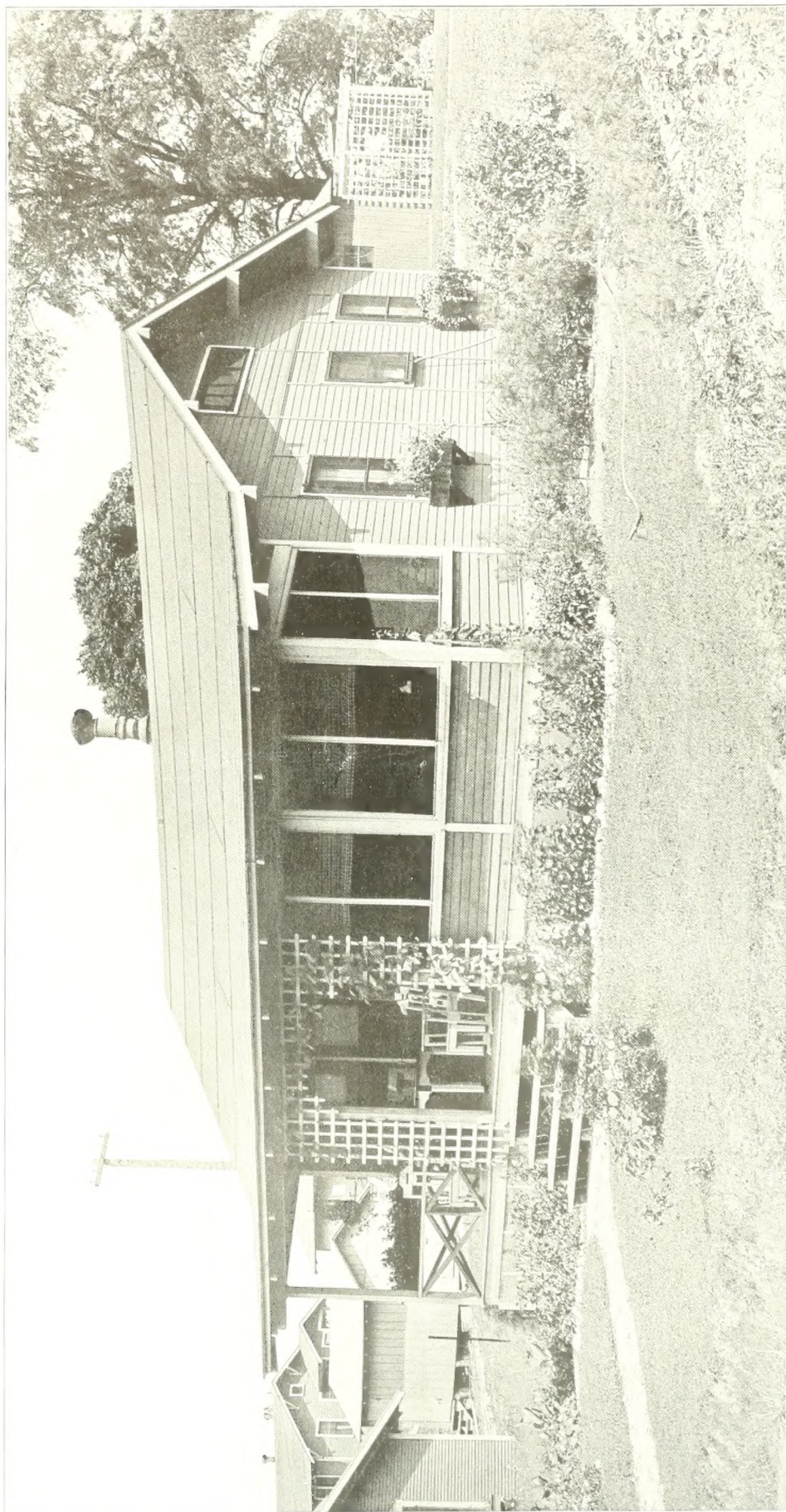
Practically, any excess of gravel in the concrete was easily avoided. The appearance and behavior of the "mix" as it poured from the mixer into the buckets in which it was carried to the forms indicated the trouble at once to the man in charge of the mixer. In the forms, the material "would pile up like a heap of rocks," and the labor of shoveling it would become so great that the men could be "depended on to kick quick and loud" whenever signs of excess gravel appeared. Addition of water in such a case—a frequent expedient with the uninitiated—is worse than useless. It simply thins the mortar, making it less adherent to the gravel, and hence more readily separated, so that the "heap of rocks" piles up more stubbornly than before.

But the troubles were not all a matter of measure and proportion. In the Taylorsville gravel pits there were pockets of "buckshot sand"—coarse angular material with large excess of the $\frac{1}{8}$ to $\frac{1}{4}$ -inch sizes. Thirteen cubic feet of this—the regular charge—would make a batch work as hard in the forms as if it contained excess of gravel. The regular 4-bag charge of cement—with the water the true "grease" of the mix—while sufficient with the aid of finer sands to fill the voids between coarser grains, was totally insufficient in the buckshot sand where these finer grains were lacking. Thus the mortar,

instead of becoming a true slime and "grease" for the gravel to slide in, would become a mass of small angular pebbles painted with a thin coat of cement, with several gallons of cement grout at the bottom of the bucket. The resulting concrete, arrived in the forms, was as sure to produce the "quick and loud kick" from the men as in the case already mentioned. Addition of water, here as before would have aggravated the trouble instead of curing it.

Methods of getting rid of the excess of the buckshot sand and "pea gravel" were given in the Bulletin for March, 1920, (these materials being so persistent in the pit at times as to require the excavator to dig in a new location). In the end the holes in the sand screen were enlarged over a strip 15 inches wide at the lower end, permitting the obnoxious materials to drop through into a waste chute discharging into the river.

The work being most of it massive, with little steel reinforcement, the mix was in general, approximately, 1:3:6. (1 of cement: 3 of sand: 6 of gravel.) It being convenient to measure the cement in the full bags as shipped, the measures to secure the proportions named were 4 bags of cement, (one cubic foot to the bag,) to 13 cubic feet of sand, to 25.8 cubic feet of mixed gravel, the latter figure being the result of mixing 16 cubic feet each of the fine and the coarse grades, as given by preliminary tests. But practically, as stated, the 16:16 mix was varied to suit the run of gravel in the pits. A 1:3:6 mix would seem to require 12 cubic yards of sand instead of 13, but as repeated tests, made regularly as the work proceeded, showed that 10 to 25 per cent of the "sand" which came through the sand screen exceeded $\frac{1}{4}$ inch in size and could be considered really as fine gravel, the extra cubic foot was added to secure a true sand ratio.



A Number Two Conservancy Cottage

The above is a picture of the residence of O. K. Guthrie at the Taylorsville Dam. It is of the exact plan and size of the No. 2 cottage listed for sale at the bottom of the opposite page. This style is put together in sections to facilitate taking apart and removing.

AUCTION SALE

At Germantown Dam, 2½ Miles Northwest of Germantown Village
Wednesday, January 26, at 1:30 P. M.



This shows what a beautiful home can be made of one of these bungalows. It is the residence of Chief Steward McCarthy at Taylorsville Dam, and is of the exact size and plan of the No. 4 cottage to be sold at Germantown.

BUNGALOWS—COTTAGES—HOUSES

These dwellings are most of them of the bungalow type, and have been used as homes by the Conservancy employees during construction of the Germantown Dam.

They are attractive modern houses, equipped with up-to-date toilets, shower baths, electric wiring, and plumbing for hot and cold water.

They are bargains for anyone desiring—

A Cozy Bungalow Home
A No. 1 Garage

A Summer Cottage
A Farm Tenant House

They are well built and can be moved at a very nominal cost. Some are built on the sectional plan, so as to be readily taken apart for removal.

These Houses will Positively be Sold to the Highest Bidder

If the Weather Is Bad the Sale Will be Held in the Steam-Heated Camp Mess Hall

TERMS OF SALE

20 per cent in cash at time of sale. 40 per cent at end of three months. 40 per cent at end of six months. 5 per cent discount for full payment in cash. The 40 per cent payments must be secured by notes without interest and with approved security. Reasonable time for removal of houses.

Following is List of the Houses for Sale

No. 1—3-room frame cottage, 24 ft. x 24 ft.; shower bath, toilet, 2 closets, built in cupboards and sink, pantry, porches, front and rear.

No. 2—4-room frame cottage, 24 ft. x 26 ft., shower bath, toilet, 2 closets, pantry, porches front and rear, sleeping porch, built-in cupboards and sink.

No. 3—4-room cottage, 18 ft. x 26 ft. (2 rooms first floor, 2 rooms second), 2 porches front and rear, shower bath, toilet, storage room, pantry, built-in cupboard and sink, closets.

No. 4—5-room frame cottage, 32 ft. x 24 ft, colonial stoop, porch in rear, shower bath, toilet, 3 closets, built-in cupboards and sink, pantry.

No. 5—5-room frame cottage, 34 ft. x 26 ft., colonial stoop, porch in rear, shower bath, toilet, pantry, built-in cupboards and sink, closets.

No. 6—2-room frame cottage, 18 ft. x 18 ft., shower bath, toilet, porch, 2 rooms (18 ft. x 10 ft. and 8 ft. x 13 ft.), one large enough to convert into two rooms.

No. 7—Cottage type boarding house, large dormitory with toilet and bath separated from living rooms and bath room of the family. Sectionally built and could be converted into 2, 3 or 4-car garage. Also ideal for summer cottage.

No. 8—Cottage used for First Aid Hospital, 30 ft. 6 in. x 18 ft., 4 rooms, including kitchen, shower bath, 2 sinks, toilet, front porch.

These houses may be inspected at any time by seeing A. L. Pauls, Division Engineer Germantown Dam. Call the Miami Conservancy District, Telephone Main 2903, Dayton, Ohio.



FIG. 258.—DOWNSTREAM END OF TAYLORVILLE OUTLET WORKS, DEC. 28, 1920

The picture is shown to give a better idea of the magnitude of the pool into which the water of the river, passing through the four conduits after the dam is completed, will issue. (The men at the left near the machine give a good scale for comparison). This pool appears in the foreground, the river having been admitted to the outlet, although it cannot make its way down the valley through the new channel, because the downstream end of the latter is not yet excavated. The snow covered earth in the immediate foreground is at the beginning of this excavation, which is now in progress. The four conduit openings are seen between the walls, each 15 feet wide, and when completed to be 19 feet, 2 inches high, their arch tops to be formed by the cross dam and spillway structure described under Fig. 254. Issuing from the conduits, (93 feet in combined width, including the intervening piers), the water will flow on into the wide, deep pool in the foreground. This pool is 200 feet wide, and 33 feet in maximum depth below the top of the center wall (which may be seen, looking like a floating plank projecting from the center pier, its snow-covered top just above the ice). A cross wall, or "wier," 26 feet high, its top 7 feet below the ice surface, crosses the pool from side wall to side wall just at the end of the center wall; and a second wall

crosses about 80 feet below (nearer in the view). Thus what seems one large pool is really two, the "hydraulic jump pool" between the conduits and the first cross wall, and the "stilling pool" between the first and second cross walls.

The discharge of a spillway level flood, through the Taylorville outlets, if one should ever occur, which is unlikely, will be an imposing spectacle, 53,600 cubic feet of water, equal to 1,675 tons, or about the mass of a twenty-five car freight train, rushing through the conduits every second, at a speed of 33 miles per hour and dashing itself into a "standing wave" of lathering foam, twenty feet or more in height, in the massive concrete basin forming the hydraulic jump pool.

From this pool it flows on over the first wall into the stilling pool, where the water quiets itself and flows on over the second wall with its destructive speed reduced to a harmless six or seven feet per second. The problem of curbing this destructive energy, was one of the most important the Conservancy engineers had to face. Its solution in the above shown outlet works has been already tried (in the Conservancy outlets at Germantown and Lockington) during the April flood of last year and was found to operate satisfactorily in accordance with the design.